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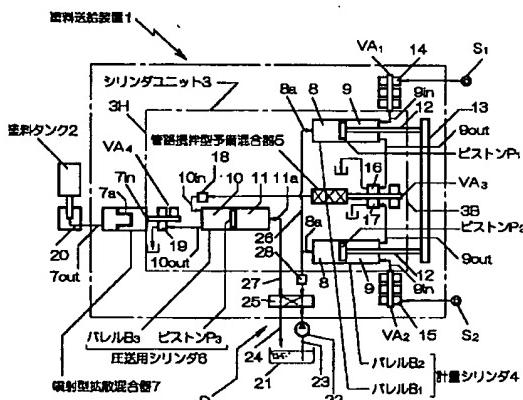
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(54) 【発明の名称】 涂料送給装置

(57) 【要約】

【課題】水性二液混合型塗料のように主剤と硬化剤が混ざり難い塗料でも、これらを均一に混合しながら塗装機や塗料タンクなどに送給でき、制御が極めて簡単で、小型、安価な塗料送給装置を提供する。

【解決手段】二種以上の塗料成分を所定の比率で混合して調整された塗料を塗装機に装着される塗料タンク
(2) に送給する塗料送給装置において、計量シリンダ(4)によって各塗料成分をその混合比率に応じた分量ずつ個別に且つ同時に圧し出し、管路攪拌型予備混合器(5)で予備混合させた塗料成分を圧送用シリンダ(6)へ充填し、この圧送用シリンダ(6)から塗料タンク(2)に塗料を圧送する際に噴射型拡散混合器(7)を通過させて、その流体圧により塗料を噴流化させることにより各塗料成分を均一に拡散させるようにした。



【特許請求の範囲】

【請求項1】二種以上の塗料成分を所定の比率で混合して調整された塗料を塗装機やこれに装備されもしくは脱着自在に装着される塗料タンク(2)に送給する塗料送給装置において、前記塗料成分を各々その混合比率に応じた分量ずつ個別に且つ同時に圧し出す計量シリンダ(4)と、当該シリンダ(4)から圧し出された前記塗料成分を通過させることによって予備混合させる管路攪拌型予備混合器(5)と、当該予備混合器(5)で前記塗料成分を予備混合した塗料を前記塗装機又は塗料タンク(2)へ圧送する圧送用シリンダ(6)と、当該シリンダ(6)から圧送される塗料の流体圧により当該塗料を噴流化させて各塗料成分を均一に拡散させる噴射型拡散混合器(7)を備えたことを特徴とする塗料送給装置。

【請求項2】前記計量シリンダ(4)が、前記塗料成分を各々その混合比率に応じた分量ずつ個別に充填する二以上のバレル(B₁、B₂)を具備し、これら各バレル(B₁、B₂)に充填された塗料成分を圧し出す各ピストン(P₁、P₂)が、同一のストローク長を有すると共に、同期的に起動及び停止せられる請求項1記載の塗料送給装置。

【請求項3】前記圧送用シリンダ(6)への塗料の充填及び当該シリンダ(6)からの塗料の圧送に同期させて、前記各計量シリンダ(4)からの塗料成分の圧し出し及び当該シリンダ(4)への塗料成分の充填を交互に行う請求項1記載の塗料送給装置。

【請求項4】前記各シリンダ(4、6)が、一つのシリンダユニット(3)に配設されると共に、当該シリンダユニット(3)に前記予備混合器(5)及び噴射型拡散混合器(7)が搭載された請求項1乃至3記載の塗料送給装置。

【請求項5】各塗料成分を混合した塗料が流れる前記予備混合器(5)、圧送用シリンダ(6)、噴射型拡散混合器(7)及びこれらを接続する配管からなる一連の流路がその上流から下流に至るまで複数に分断されると共に、分断された夫々の流路に洗浄流体を個別に導入してその流路内を洗浄する洗浄系(F₁～F₄)を備えた請求項1乃至4記載の塗料送給装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、二種以上の塗料成分を所定の比率で混合して調整した塗料、特に主剤と硬化剤からなる水性二液混合型塗料を、塗装機や、これに装備もしくは脱着自在に装着される塗料タンクに送給する塗料送給装置に関する。

【0002】

【従来の技術】近年では地球的規模における環境保護の観点から、塗装工程における排出有機溶剤規制や塗料のVOC規制が高まり、塗装業界においてもこのような要

請にこたえるべく、有機溶剤を使用しない水性塗料が開発され、その市場規模も拡大している。

【0003】自動車ボディの塗装においては、下塗り、中塗り、上塗りのうち、下塗りはもともと水性塗料を電着塗装により塗装しており、従来有機溶剤系塗料を使用していた中塗りでも、今ではそのほとんどが水性塗料や粉体塗装に切り替わりつつある。

【0004】また、上塗りも、一部の特殊な色を除きベースコートはそのほとんどが水性塗料や粉体塗料に替わりつつあるが、高級品質が要求されるクリアコートだけは、外観性、耐候性、耐水性、耐化学薬品性、耐酸性雨性、耐スリキズ性等において高度な塗膜品質を満たす水性塗料がなく、有機溶剤系の一液型又は二液混合型塗料を使用せざるを得ないのが現状であった。

【0005】しかし最近になって、有機溶剤系二液混合型塗料に劣らない物性を有する強固な塗膜の水性クリアコートとして、主剤と硬化剤を混合して使用する水性二液混合型塗料が開発された。この水性二液混合型塗料は、水酸基を持った水溶性もしくは水分散型ポリオールを基体樹脂とする主剤に、水分散可能なポリイソシアネートを主成分とする硬化剤を混合して架橋・硬化させるものである。

【0006】

【発明が解決しようとする課題】しかしながら、この種の水性二液混合型塗料は、主剤となる水分散型ポリオールが親水性であるのに対し、硬化剤となるポリイソシアネートが疎水性であるため、水と油のように分離し易く、均一に混合させることが困難であるという問題があった。

【0007】このため、ブレンダー等で予め機械的に攪拌混合したものを塗装機に供給するようになっているが、攪拌混合すると同時に主剤と硬化剤が硬化反応を開始してしまうので、自動車塗装のように連続して長時間塗装する場合は、供給している間に徐々に塗料が硬化していき、塗料粘度が変化して塗装品質が一定でなくなったり、塗料供給配管内に残存する塗料が硬化して目詰まりを起したり、塗装機から吐出されて塗膜面に付着してブツと称する塗装不良を生ずるおそれがあった。

【0008】一方、有機溶剤系二液混合型塗料は、塗料供給流路中にスタティックミキサを介装しておけば均一に混合可能であるため、予め混合しておかなくても、使用する直前に混合しながら塗料供給することが可能であったが、水性二液混合型塗料は上述のように混ざり難いため、塗料供給流路中にスタティックミキサを介装しても、塗料を均一に混合させて十分な塗膜性能を得ることができなかった。

【0009】また、二液混合型塗料は主剤と硬化剤の混合比が変化すると、混合された塗料の物性も変化するので、塗装品質を均一に維持するためには、混合比を正確にコントロールする必要があり、その一方で、制御が極

めて簡単で、塗装ラインに設置したときに邪魔にならぬ、しかも、設備費やランニングコストが安価であることが望ましい。

【0010】そこで本発明は、水性二液混合型塗料のように主剤と硬化剤が混ざり難い塗料でも、これらを均一に混合しながら塗装機や塗料タンクなどに送給することができ、しかも、制御が極めて簡単で、小型、安価な塗料送給装置を提供することを技術的課題としている。

【0011】

【課題を解決するための手段】この課題を解決するために、請求項1の発明は、二種以上の塗料成分を所定の比率で混合して調整された塗料を塗装機やこれに装備されもしくは脱着自在に装着される塗料タンクに送給する塗料送給装置において、前記塗料成分を各々その混合比率に応じた分量ずつ個別に且つ同時に圧し出す計量シリンダと、当該シリンダから圧し出された前記塗料成分を通過させることによって予備混合させる管路攪拌型予備混合器と、当該予備混合器で前記塗料成分を予備混合した塗料を前記塗装機又は塗料タンクへ圧送する圧送用シリンダと、当該シリンダから圧送される塗料の流体圧により当該塗料を噴流化させて各塗料成分を均一に拡散させる噴射型拡散混合器を備えたことを特徴とする。

【0012】この請求項1の発明を用いて、水性二液混合型塗料の塗料成分となる主剤及び硬化剤を混合して送給する場合について説明すると、計量シリンダから主剤及び硬化剤がその混合比率に応じた分量ずつ個別に且つ同時に圧し出され、各塗料成分がその混合比率に応じた一定流量比で予備混合器に送給されて予備混合され、これによって各塗料成分が均一に分散される。

【0013】したがって、予備混合器で混合された塗料は、各塗料成分を均一に分散させた状態で圧送用シリンダに充填され、その混合比率も常に一定に維持されることになる。

【0014】そして、このようにして塗料成分を均一に分散させた塗料が圧送用シリンダ内に一時的に蓄えられるので、その時間を利用して各塗料成分の境界面では分子拡散が進み、各塗料成分同士が馴染んでくる。

【0015】ただし、この時点では均一に分散しているといつても各塗料成分の液滴の粒径が、まだ比較的大きく、このまま塗装しても十分な塗膜性能が得られない。

【0016】そこで、圧送用シリンダから塗装機や塗料タンクに対して塗料を圧送すると、その塗料が噴射型拡散混合器で噴流化され、粒径の大きな各塗料成分同士が微粒化して拡散するので、親水性主剤と疎水性硬化剤などの混ざり難い塗料成分でも均一に混合される。

【0017】このように予備混合-噴射拡散混合の2段階で各塗料成分同士が均一に混合されて送給されるので、塗料タンクに塗料を充填する場合はもちろんのこと、塗装機に塗料を直接送給して長時間に連続して塗装する場合にも、各塗料成分を塗装機の直前で均一に混合

しながら送給することができ、予めブレンダなどにより機械的に混合したものを蓄えておく必要がない。

【0018】請求項2の発明は、計量シリンダが、前記塗料成分を各々その混合比率に応じた分量ずつ個別に充填する2以上のバレルを具備し、これら各バレルに充填された塗料成分を圧し出す各ピストンが、同一のストローク長を有すると共に、同期的に起動及び停止せられるよう成了されている。

【0019】この請求項2の発明によれば、主剤及び硬化剤等の塗料成分をその混合比率に応じた分量ずつ各バレルに個別に充填し、各ピストンを同一のストロークで同期的に起動及び停止させるだけで、塗料成分が各バレルから混合比率に応じた流量で圧し出されるので、面倒な制御は一切不要となる。

【0020】請求項3の発明は、圧送用シリンダへの塗料の充填及び当該シリンダからの塗料の圧送に同期させて、前記各計量シリンダからの塗料成分の圧し出し及び当該シリンダへの塗料成分の充填を交互に行うようになっている。

【0021】この請求項3の発明によれば、圧送用シリンダから塗料が圧送されている間に各計量シリンダに塗料成分が充填され、圧送用シリンダが空になると同時に、各計量シリンダから塗料成分が圧し出されて圧送用シリンダに塗料が充填されるので、圧送用シリンダは塗料の充填と圧送を連続してインターバルを設けることなく交互に行うことができ、したがって、タクトタイムに無駄がない。

【0022】また、請求項4の発明のように、各シリンダを一つのシリンダユニットに配設し、シリンダユニットにスタティックミキサ及び噴射型拡散混合器を搭載すれば、これらが一体で設けたオールインワンに形成されるので、装置全体の小型化・軽量化が図られ、全体としてよりコンパクトになる。

【0023】請求項5の発明は、各塗料成分を混合した塗料が流れる予備混合器、圧送用シリンダ、噴射型拡散混合器及びこれらを接続する配管からなる一連の流路がその上流から下流に至るまで複数に分断されると共に、分断された夫々の流路に洗浄流体を個別に導入してその流路内を洗浄する洗浄系を備えている。

【0024】この請求項5の発明によれば、分断された夫々の流路を同時に洗浄できるので、計量シリンダから水性二液混合型塗料の主剤及び硬化剤を供給する場合でも、スタティックミキサから塗料タンクに至る流路内に残存する二液混合型塗料が硬化する前に、これを短時間で簡単に洗浄除去することができる。

【0025】

【発明の実施の形態】以下、本発明の実施の形態を図面に基づいて具体的に説明する。図1は本発明に係る塗料送給装置の一例を示す流体回路図、図2はその外観図、図3はその動作を示す説明図、図4は洗浄系を示す説明

図である。

【0026】図1～図4に示す塗料送給装置1は、主剤と硬化剤を塗料成分とする水性二液混合型塗料を所定の比率で混合し、塗装機に脱着自在に装着されるカートリッジ式の塗料タンク2に送給して充填するタイプのものである。

【0027】この塗料送給装置1は、シリンドユニット3に、主剤供給源S₁及び硬化剤供給源S₂から送給される主剤及び硬化剤を各々その混合比率に応じた分量ずつ個別に且つ同時に圧し出す計量シリンド4と、当該計量シリンド4から圧し出された主剤及び硬化剤を通過させることによって予備混合させるスタティックミキサ（管路攪拌型予備混合器）5と、当該スタティックミキサ5で主剤及び硬化剤を予備混合した塗料を塗料タンク2へ送給する圧送用シリンド6と、当該シリンド6から塗料タンク2へ圧送される塗料の流体圧により当該塗料を噴流化させて各塗料成分を均一に拡散させるジェットディスペーションと称する噴射型拡散混合器7が設けられている。

【0028】シリンドユニット3は略直方体のブロック状に形成されており、計量シリンド4のバレルB₁及びB₂が、圧送用シリンド6のバレルB₃を挟んでその両側に配されるように互いに平行に形成されている。また、各シリンド4及び6は塗料成分及び塗料を圧し出すときに油圧駆動されるピストンP₁、P₂及びP₃を備えている。

【0029】そして、計量シリンド4は、ピストンP₁及びP₂を境にシリンドユニット3のヘッド3H側が作動油室8、ボトム3B側が塗料成分室9に形成されている。また、圧送用シリンド6は、ピストンP₃を境にシリンドユニット3のヘッド3H側が塗料室10、ボトム3B側が作動油室11に形成されている。

【0030】計量シリンド4の各バレルB₁及びB₂は、主剤及び硬化剤を各々その混合比率に応じた分量ずつ個別に充填し得る容量に形成され、各バレルB₁及びB₂に充填された主剤及び硬化剤を圧し出す各ピストンP₁及びP₂が、同一のストローク長を有すると共に、同期的に起動及び停止せられるようになっていている。

【0031】すなわち、各ピストンP₁及びP₂のストローク長に対する夫々の圧出容量が、混合比率に応じて設定されており、ストローク長が同一なことから、各バレルB₁及びB₂から押し出される主剤及び硬化剤の流量比は、混合比率に等しくなる。

【0032】これら各ピストンP₁及びP₂は、ピストンロッド12を介してビーム13に一体に取り付けられ、バレルB₁及びB₂の作動油室8に供給される作動油の供給圧及び塗料成分室9への塗料成分供給圧により、互いに同期して同一のストロークで往復駆動される。

【0033】また、作動油室8には作動油の流入出口8aが形成され、塗料成分室9には塗料成分の流入口9in及び流出口9outが形成されている。そして、各塗料成分室9の流入口9inは、主剤（硬化剤）、洗浄エア、洗浄液を選択的に供給するバルブ装置VA₁（VA₂）の主剤バルブ14（硬化剤バルブ15）を介して主剤供給源S₁（硬化剤供給源S₂）に接続されており、流出口9outは、バルブ装置VA₃の主剤バルブ16（硬化剤バルブ17）を介してスタティックミキサ5のシリンドボトム3B側に形成された流入口5inに接続されている。

【0034】バルブ装置VA₃は、スタティックミキサ5へ通ずる流路を切り換えるもので、計量シリンド4から圧し出された主剤及び硬化剤と、洗浄エアと、洗浄液とを選択的にスタティックミキサ5内に供給すると共に、計量シリンド4から排出された洗浄液をドレンに排出できるようになっている。また、スタティックミキサ5のシリンドヘッド3H側に形成された流出口5outが、オンオフバルブ18を介して圧送用シリンド6に接続されている。

【0035】スタティックミキサ5は、主剤及び硬化剤が合流して流れる流路内に、その流れを繰返し分割し、置換し、重合せて混合する多数のエレメントが流れの方向に沿って配されてなる。

【0036】圧送用シリンド6は、前記各ピストンP₁及びP₂が1ストロークしたときに送給される主剤及び硬化剤の総供給量に等しい容量に形成されると共に、バレルB₃に充填された塗料を圧し出す各ピストンP₃が、前記各ピストンP₁及びP₂と同一のストローク長で往復されるようになっている。そして、このピストンP₃は、バレルB₃の塗料室10に供給される塗料供給圧及び作動油室11に供給される作動油供給圧により往復駆動される。

【0037】なお、主剤及び硬化剤の混合比が例えば5：2であるときに、各シリンド4及び6の各ピストンP₁～P₃を単位長さ動かしたときに圧し出される主剤：硬化剤：塗料の流量比が5：2：7になるように各バレルB₁～B₃が設計されている。

【0038】また、バレルB₃の容量は任意であるが、本例では、ピストンP₃を3往復させたときに塗料タンク2への混合塗料の充填が完了されるように、塗料タンク2の約1／3程度と小型に形成されている。

【0039】この圧送用シリンド6の塗料室10には塗料流入口10in及び流出口10outが形成され、作動油室11には作動油の流入出口11aが形成されている。塗料室10の流出口10outは、バルブ装置VA₄の塗料バルブ19を介して噴射型拡散混合器7に接続されている。

【0040】このバルブ装置VA₄は、圧送用シリンド6の流出口10outを噴射型拡散混合器7側とドレン側

に切換接続と共に、洗浄エア及び洗浄液を選択的に噴射型拡散混合器7に供給するようになっている。

【0041】噴射型拡散混合器7は、流入口7inと流出口7outの間に小径オリフィス7aが形成されている。

本例では、直径0.2～0.5mm程度に形成された同軸の対向型小径オリフィス7aが形成されてなり、圧送用シリンダ6から1～10MPaで供給される二液混合型塗料がオリフィス7aを通過するときに噴流化される。

【0042】これにより、塗料中に含まれる主剤及び硬化剤は微粒化状態となって拡散されるので、二液混合型塗料がより均一に混合されることとなり、このように十二分に混合された塗料が塗料吐出ポート20に接続された塗料タンク2へ送給される。

【0043】また、前記各シリンダ4及び6に作動油を切換供給と共に、各シリンダ4及び6から排出される作動油を回収する作動油供給系Dは、作動油タンク21からポンプ22により1～10MPaの供給圧で作動油を供給する作動油供給管23と、作動油タンク21に作動油を戻すドレン24の夫々が、切換弁25を介して、計量シリンダ4の各作動油室8に接続された低圧配管26と、圧送用シリンダ6の作動流体室11に連通された高圧配管27に切換可能に接続されている。

【0044】なお、低圧配管26には、設定圧1MPa以下の減圧弁28が介装され、計量シリンダ4から圧し出される主剤及び硬化剤の供給圧を低圧に維持するようになされている。

【0045】そして、各シリンダ4及び6に対して作動油供給系Dにより作動油の供給／排出を所定のタイミングで行うと同時に、各バルブ装置VA₁～VA₄、オンオフバルブ18の開閉制御を行うことにより、主剤及び硬化剤の充填／圧出、塗料の充填／圧出を行う。

【0046】以上が本発明の一例であって、次にその作用について図3を伴って説明する。まず、図3(a)に示すように、計量シリンダ4の作動油室8をドレン24に接続し、バルブ装置VA₁及びVA₂の主剤バルブ14及び硬化剤バルブ15を開き、夫々の塗料成分室9に親水性主剤及び疎水性硬化剤を充填する(図3(b))。

【0047】そして、バルブ装置VA₁及びVA₂の各バルブを閉じ、スタティックミキサ5の流入口5inに形成されたバルブ装置VA₃の主剤バルブ16及び硬化剤バルブ17を開き、作動油供給系Dの切換弁25を操作して作動油供給管23を低圧配管26に接続し、圧送用シリンダ6の高圧配管27をドレン24に接続する。

【0048】これにより、計量シリンダ4に1MPa以下の低圧で作動油が供給され、ピストンP₁及びP₂が同期して一体的にシリンダボトム3b側に摺動し、親水性主剤及び疎水性硬化剤がスタティックミキサ5に圧し出されて予備混合され、圧送用シリンダ6のバレルB₃内に流入されていく(図3(c))。

【0049】このとき、ピストンP₁及びP₂が同期しているので、押出速度が変化しても、計量シリンダ4から供給される主剤及び硬化剤の流量比は常に混合比に等しい。そして、主剤及び硬化剤がその混合比率に応じた一定流量比でスタティックミキサ5に送給されると、主剤及び硬化剤は均一に分散された状態で圧送用シリンダ6に流入することとなる。

【0050】したがって、圧送用シリンダ6内には、予め設定された混合比率に維持されて混合された主剤及び硬化剤が、均一に分散された状態で充填される。しかも、主剤及び硬化剤は低圧で供給されているので、主剤及び硬化剤がスタティックミキサ5内を通過する際や、混合塗料が圧送用シリンダ6に流入される際に、気泡が生じることもない。

【0051】そして、このようにして主剤及び硬化剤を均一に分散させた塗料が圧送用シリンダ内に一時的に蓄えられるので、その時間を利用して主剤及び硬化剤の境界面では分子拡散が進み、主剤及び硬化剤が各塗料成分同士が馴染んでくる。

【0052】ただし、主剤及び硬化剤が夫々親水性及び疎水性であるため、スタティックミキサ5で呼び混合させただけでは、個々の液滴の直径が最大0.5mm程度と大きく、そのまま塗装しても十分な塗膜性能が得られない。そこで、圧送用シリンダ6への充填が完了する

(図3(d))と、作動油供給系Dの切換弁25を操作して、作動油供給管23を高圧配管27に接続すると共に、各計量シリンダ4の作動油室8をドレン24に接続する。

【0053】同時に、オンオフバルブ18を閉じて圧送用シリンダ6からの逆流を阻止し、噴射型拡散混合器7に連通されるバルブ装置VA₄の塗料バルブ19を開く。さらに、各計量シリンダ4に主剤及び硬化剤を供給するバルブ装置VA₁及びVA₂の主剤バルブ14及び硬化剤バルブ15を開く。

【0054】これにより、まず、圧送用シリンダ6の作動油室9に1～10MPaの高圧で作動油が供給され、塗料室10から噴射型拡散混合器7に対して作動油の供給圧と等しい圧力で二液混合型塗料が送り出される(図3(e))。

【0055】噴射型拡散混合器7の流入口7inから1～10MPaの高圧で流入された二液混合型塗料は、直径0.2～0.5mm程度に形成された同軸の対向型小径オリフィス7aに向かって徐々に高圧となり、小径オリフィス7aを通過する際に噴流化される。これにより、塗料中に含まれる主剤及び硬化剤は微粒化状態となって拡散されるので、混ざり難い親水性主剤及び疎水性硬化剤でも均一に拡散混合されて、これが塗料充填ポート20に接続された塗料タンク2へ供給される。

【0056】このように予備混合-噴射拡散混合の2段階で各塗料成分同士が均一に混合されて送給されるの

で、塗料タンク2に塗料を充填する場合はもちろんのこと、塗装機に塗料を直接送給して長時間連続して塗装する場合にも、各塗料成分を塗装機の直前で均一に混合しながら送給することができ、予めブレンダなどにより機械的に混合したものを蓄えておく必要がない。

【0057】なお、圧送用シリンダ6から二液混合型塗料を圧し出して塗料タンク2に充填している間に、計量シリンダ4に対し主剤及び硬化剤が供給され、夫々の塗料成分室9に主剤及び硬化剤が充填されていく(図3(e))。このとき、各計量シリンダ4への主剤及び硬化剤の供給圧が低くとも、夫々の作動油はドレン24に逃がされるので、圧送用シリンダ6からの塗料の圧しだしが完了するまでに短時間で充填することができる。

【0058】また、圧送用シリンダ6の容量は塗料タンク2 1/3であるから、圧送用シリンダ6内の混合塗料の押出が完了すると、直ちに、各計量シリンダ4から主剤及び硬化剤を圧し出して、混合塗料を圧送用シリンダ6に充填し、これを再び圧し出して塗料タンク2に供給する手順を3回繰返して、ピストンP₃を合計3往復させれば、塗料タンク2への混合塗料の充填が完了する(図3(b)～(e))。

【0059】このように、圧送用シリンダ6から混合塗料が圧し出されている間に、各計量シリンダ4に主剤及び硬化剤が充填されるので、圧送用シリンダ6からの塗料の押出が完了すると同時に、圧送用シリンダ6に塗料を充填開始することができる。

【0060】したがって、圧送用シリンダ6から、塗料の充填と圧送との間にインターバルを設けることなく、これらを連続して交互に行うことができ、したがって、タクトタイムに無駄がない。また、一の塗料タンク2について混合塗料の充填が完了した後、次に待機している空の塗料タンク2を塗料吐出ポート20にセットしながら、混合塗料を圧送用シリンダに充填することができるので、塗料タンク2を交換して充填開始するまでのタクトタイムも短縮することができる。

【0061】次いで、この塗料送給装置1を洗浄する場合はバルブ装置VA₁～VA₄を操作することにより、図4に示すように、流路を上流側から下流側へ4つの洗浄系F₁～F₄に分断する。各洗浄系F₁～F₄には、夫々の上流側に配された各バルブ装置VA₁～VA₄から洗浄液・洗浄エアが導入され、その洗浄廃液が、洗浄系F₃～F₄では下流側のバルブ装置VA₃、VA₄からドレンへ排出され、洗浄系F₁～F₂では塗料タンク2が接続されていない充填ポート20から外部に排出される。

【0062】具体的には、洗浄系F₁及びF₂は、バルブ装置VA₁及びVA₂から各計量シリンダ4内を通ってバルブ装置VA₃のドレンへ至る流路を洗浄し、洗浄系F₃は、バルブ装置VA₃からスタティックミキサ5及び圧送用シリンダ6内を通ってバルブ装置VA₄のドレンへ至る流路を洗浄し、洗浄系F₄は、バルブ装置V

A₄から噴射型拡散混合器7内を通って塗料充填ポート6に至る流路を洗浄する。

【0063】このように、流路を複数の洗浄系F₁～F₄に分断して、夫々を同時に洗浄することができるので、塗料送給装置1全体を、迅速且つ確実に洗浄することができ、必要に応じて任意のタイミングで洗浄を行うことにより、二液混合型塗料がスタティックミキサ5、圧送用シリンダ6、噴射型拡散混合器7やこれらを接続する配管内などに残留して硬化することを未然に防止することができる。

【0064】なお、作動油供給系Dは、一つのポンプ2-2で各シリンダ4、6に対し作動油を供給する場合に限らず、計量シリンダ4に低圧で作動油を供給するポンプを設けた系と、圧送用シリンダ6に高圧の作動油を供給するポンプを設けた系を並設してもよい。さらに、計量シリンダ4から塗料成分を低圧で圧し出し、圧送用シリンダ6から二液混合型塗料を高圧で圧し出す場合に限らず、1MPa程度の一定圧力で供給する場合でもよい。

【0065】また、圧送用シリンダ6のピストンロッド(図示せず)を、計量シリンダ4のピストンロッドR₁及びR₂と共にビーム13に一体化に取り付けておけば、全てのピストンP₁～P₃を同期させて同じストロークで摺動させることもできる。

【0066】これによれば、各ピストンP₁～P₃が同期して後退するときに、各計量シリンダ4から主剤及び硬化剤が混合比に応じた所定流量比で送り出される同時に、圧送用シリンダ6に混合塗料が充填される。また、各ピストンP₁～P₃が同期して前進するときに、圧送用シリンダ6から塗料タンク2に混合塗料が圧し出されると同時に、各計量シリンダ4に主剤及び硬化剤が送給される。このように、各ピストンP₁～P₃を同期させて同じストロークで進退させるだけで、主剤及び硬化剤が所定の混合比で混合されるので、その流量制御及びタイミング制御がより簡単になる。

【0067】さらに、上述の説明では、主剤と硬化剤からなる二液混合型塗料について説明したが、複数の主剤と硬化剤、主剤と添加剤など、二種以上の塗料成分を混合する任意の多成分混合型塗料に適用し得る。

【0068】さらにまた、本発明の塗料送給装置1は、塗装機内に装備または装着される塗料タンク2に塗料を充填させる場合に限らず、塗料の供給を受けながら塗装を行う塗装機へ直接塗料を供給する塗料供給装置として使用することもできる。

【0069】

【発明の効果】以上述べたように、本発明によれば、主剤及び硬化剤等の塗料成分が、計量シリンダからその混合比率に応じた分量ずつ個別に且つ同時に圧し出されるので、各塗料成分がその混合比率に応じた一定流量比で予備混合器に送給されて均一に分散され、その塗料を圧送用シリンダに充填した後、塗装機や塗料タンクに対し

て圧送すると、その塗料が噴射型拡散混合器で噴流化され、粒径の大きな各塗料成分同士が微粒化して拡散するので、親水性主剤と疎水性硬化剤などの混ざり難い塗料成分でも均一に混合した状態で塗料タンクに充填することができるという大変優れた効果を奏する。

【0070】このように予備混合一噴射拡散混合の2段階で各塗料成分同士が均一に混合されて送給されるので、塗料タンクに塗料を充填する場合はもちろんのこと、塗装機に塗料を直接送給して長時間に連続して塗装する場合にも、予めブレンダなどにより機械的に混合したものをおいておくまでもなく、各塗料成分を塗装機や塗料タンクの直前で均一に混合しながら送給することができるという効果がある。

【0071】また、計量シリンダから主剤及び硬化剤等の塗料成分が、その混合比率に応じた分量ずつ圧し出されるので、面倒な流量制御は一切不要になるという効果もある。このとき、例えば、計量シリンダとして、同一のストロークで同期的に起動及び停止されるピストンを備えると共に、主剤及び硬化剤等の塗料成分をその混合比率に応じた分量ずつ個別に充填可能な容積のバレルを用いれば、ピストンを同期させて動かすだけで各塗料成分をその混合比率に応じた流量比で圧し出すことができ、ピストンの駆動制御も極めて簡単になるという効果がある。

【0072】さらに、圧送用シリンダへの塗料の充填及び当該シリンダからの塗料の圧送に同期させて、各計量シリンダからの塗料成分の圧し出し及び当該シリンダへの塗料成分の充填を交互に行えば、圧送用シリンダから塗料を圧送している間に各計量シリンダに塗料成分が充填され、圧送用シリンダが空になると同時に、各計量シリンダから塗料成分が圧し出されて圧送用シリンダに塗料が充填されるので、圧送用シリンダは塗料の充填と圧送との間にインターバルを設けることなく、充*

* 填と圧送を連続して交互に行うことができ、したがって、タクトタイムに無駄がなく、作業効率に優れる。

【0073】そして、各シリンダを一つのシリンダユニットに配設し、シリンダユニットに予備混合器及び拡散混合器を搭載すれば、これらが一体に配されたオールインワンタイプに形成されるので、装置全体の小型化・軽量化が図られ、全体としてよりコンパクトにすることができるという利点もある。

【0074】また、予備混合器、圧送用シリンダ、噴射型拡散混合器及びこれらを接続する配管からなる一連の流路をその上流から下流に至るまで複数に分断し、分断された夫々の流路に洗浄流体を個別に導入すれば、夫々の流路を同時に洗浄できるので、計量シリンダから水性二液混合型塗料の主剤及び硬化剤を供給する場合でも、予備混合器から塗料タンクに至る流路内に残存する二液混合型塗料が硬化する前に、これを短時間で簡単且つ確実に洗浄除去することができるという効果もある。

【図面の簡単な説明】

【図1】本発明に係る塗料送給装置を示す流体回路図。

【図2】その外観図。

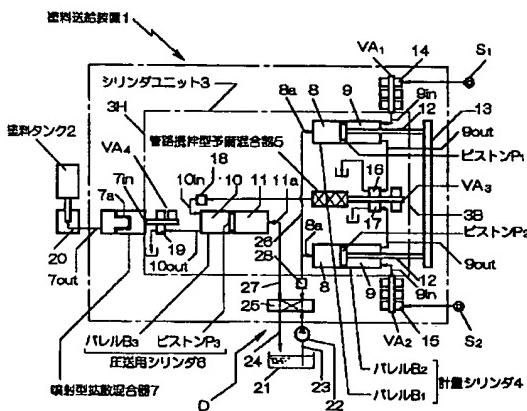
【図3】その動作を示す説明図。

【図4】その洗浄系を示す説明図。

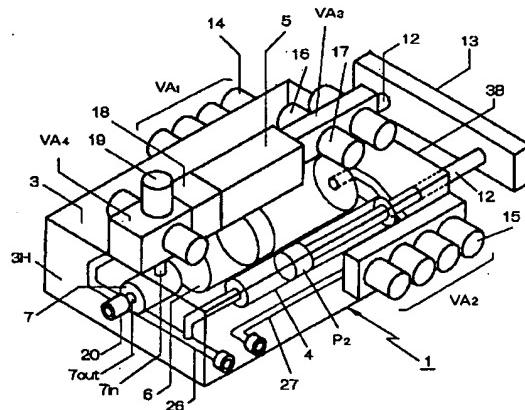
【符号の説明】

- 1 ……塗料送給装置
- 2 ……塗料タンク
- 3 ……シリンダユニット
- 4 ……計量シリンダ
- 5 ……管路攪拌型予備混合器
- 6 ……圧送用シリンダ
- 7 ……噴射型拡散混合器
- B₁ ~ B₃ ……バレル
- P₁ ~ P₃ ……ピストン
- F₁ ~ F₄ ……洗浄系

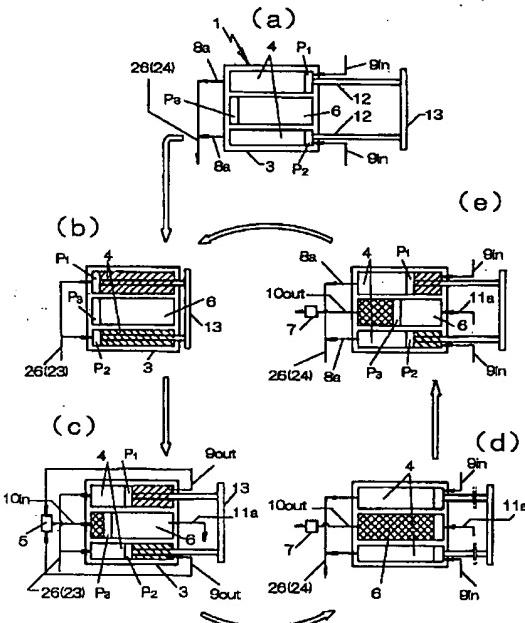
【図1】



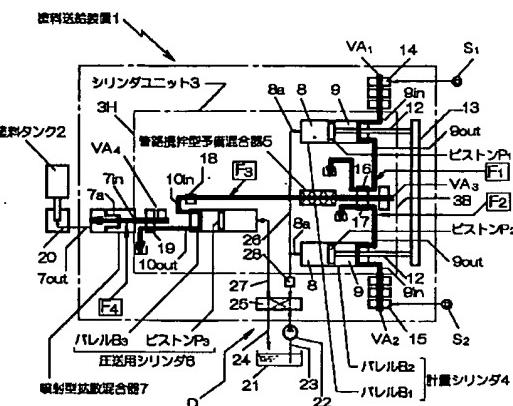
【図2】



【図3】



[図4]



フロントページの続き

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* NOTICES *

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] In the coating feeding equipment fed into the coating tank (2) with which the coating which mixed two or more sorts of coating components by the predetermined ratio, and was adjusted is equipped by a coater and this, or it is equipped free [desorption] Respectively said coating component according to the daily dose [every] individual according to the mixed ratio And the measuring cylinder which it begins to press to coincidence (4), The duct stirring mold reserve mixer which carries out preliminary mixing by passing said coating component which began to be pushed from the cylinder (4) concerned (5), The cylinder for feeding which feeds the coating which carried out preliminary mixing of said coating component with the reserve mixer (5) concerned to said coater or a coating tank (2) (6), Coating feeding equipment characterized by having the injection mold diffusive-mixing machine (7) which makes the coating concerned jet-ize by the hydrostatic pressure of the coating fed from the cylinder (6) concerned, and makes homogeneity diffuse each coating component.

[Claim 2] Coating feeding equipment according to claim 1 started and suspended synchronous while each piston (P1, P2) which begins to press the coating component with which possessed two or more barrels (B1, B-2) with which said measuring cylinder (4) fills up said coating component according to the daily dose [every] individual according to the mixed ratio respectively, and each [these] barrel (B1, B-2) was filled up has the same stroke length.

[Claim 3] Coating feeding equipment according to claim 1 which it is made to synchronize with restoration of the coating to said cylinder for feeding (6), and feeding of the coating from the cylinder (6) concerned, and the coating component from said each measuring cylinder (4) begins to push, and is filled up with the coating component to the cylinder (4) concerned by turns.

[Claim 4] Coating feeding equipment according to claim 1 to 3 with which said reserve mixer (5) and the injection mold diffusive-mixing machine (7) were carried in the cylinder unit (3) concerned while said each cylinder (4 6) was arranged in one cylinder unit (3).

[Claim 5] While being divided by plurality until a series of passage which consists of piping

which connects said cylinder (6) injection mold diffusive-mixing machine for reserve mixer (5) feeding (7) and these to which the coating which mixed each coating component flows results [from the upstream] down-stream Coating feeding equipment [equipped with the washing system (F1-F4) which introduces a washing fluid into each divided passage according to an individual, and washes the inside of the passage] according to claim 1 to 4.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the coating feeding equipment which feeds the coating which mixed and adjusted two or more sorts of coating components by the predetermined ratio, especially the aquosity 2 liquid hybrid model coating which consists of base resin and a curing agent into the coating tank equipped by a coater and this free [equipment or desorption].

[0002]

[Description of the Prior Art] In recent years, from a viewpoint of the environmental protection in a terrestrial scale, the discharge organic solvent regulation and the VOC regulation of a coating in a painting process increase, the water paint which does not use an organic solvent is developed in order to reply to such a request also in the paint industry, and the market size is also expanded.

[0003] In paint of the automobile body, the under coat is painting the water paint by electropainting from the first among an under coat, a middle coat, and finishing, and, also in the middle coat which was using the organic solvent system coating conventionally, now, the most is changing to a water paint or powder coating.

[0004] Moreover, although the most was replacing the base coat with a water paint or powder coatings except for some special colors also in finishing, the present condition was only the clear coat where high-class quality's is demanded not having the water paint which fulfills advanced paint film quality in appearance nature, weatherability, a water resisting property, resistance to chemicals, acid rain-proof nature, score-mark-proof nature, etc., and using the 1 liquid type of an organic solvent system, or a 2 liquid hybrid model coating.

[0005] However, the aquosity 2 liquid hybrid model coating which mixes and uses base resin and a curing agent as an aquosity clear coat of the firm paint film which recently has the physical properties which are not inferior to an organic solvent system 2 liquid hybrid model coating was developed. This aquosity 2 liquid hybrid model coating mixes the curing agent which uses as a principal component poly isocyanate in which moisture powder is possible to the base resin which uses water solubility with a hydroxyl group, or moisture powder type polyol as base resin, and is bridge formation and a thing to stiffen.

[0006]

[Problem(s) to be Solved by the Invention] However, since the poly isocyanate which serves as a curing agent to the moisture powder type polyol used as base resin being a hydrophilic property was hydrophobicity, it was easy to dissociate like water and an oil, and this kind of aquosity 2 liquid hybrid model coating had the problem that it was difficult to mix homogeneity.

[0007] For this reason, although he is trying to supply to a coater what carried out stirring mixing mechanically beforehand with the blender etc. Since base resin and a curing agent start a hardening reaction at the same time it carries out stirring mixing, when carrying out long duration paint continuously like automobile paint While supplying, the coating hardens gradually, coating viscosity changed, paint quality becomes less fixed, the coating which remains in a coating charging line hardened, and there was [**** / starting blinding] a possibility of producing the painting defect who is breathed out from a coater, adheres to a paint film side, and calls BUTSU.

[0008] On the other hand, since an aquosity 2 liquid hybrid model coating was not able to be mixed easily as mentioned above, even if it was possible to have carried out coating supply, mixing just before using it even if it did not mix beforehand, since it was mixable to homogeneity, but it infixes the static mixer all over the coating feeder current way, homogeneity was not able to be made to have been able to mix a coating, if the organic solvent system 2 liquid hybrid model coating infixes the static mixer all over the coating feeder current way, and sufficient paint film engine performance was not able to be obtained.

[0009] If the mixing ratio of base resin and a curing agent changes, since the physical properties of the mixed coating will also change, in order to maintain paint quality to homogeneity, a 2 liquid hybrid model coating needs to control a mixing ratio correctly, it is one of these, is very easy to control, and does not become obstructive, when it installs in paint Rhine, but, moreover, it is desirable for an installation cost and a running cost to be cheap.

[0010] Then, this invention can be fed into a coater, a coating tank, etc. also in the coatings with which base resin and a curing agent cannot be easily mixed like an aquosity 2 liquid hybrid model coating, mixing these to homogeneity, moreover, is very easy to control and makes it the technical technical problem to offer small and cheap coating feeding equipment.

[0011]

[Means for Solving the Problem] In order to solve this technical problem, invention of claim 1 In the coating feeding equipment fed into the coating tank with which the coating which mixed two or more sorts of coating components by the predetermined ratio, and was adjusted is equipped by a coater and this, or it is equipped free [desorption] Respectively said coating component according to the daily dose [every] individual according to the mixed ratio And the measuring cylinder which it begins to press to coincidence, The duct stirring mold

reserve mixer which carries out preliminary mixing by passing said coating component which began to be pushed from the cylinder concerned, It is characterized by having the injection mold diffusive-mixing machine which makes the coating concerned jet-ize by the hydrostatic pressure of the coating fed from the cylinder for feeding which feeds the coating which carried out preliminary mixing of said coating component with the reserve mixer concerned to said coater or a coating tank, and the cylinder concerned, and makes homogeneity diffuse each coating component.

[0012] If the case where the base resin and the curing agent used as the coating component of an aquosity 2 liquid hybrid model coating are mixed and fed using invention of this claim 1 is explained a measuring cylinder to base resin and a curing agent -- the mixing ratio -- the daily dose [every] individual exception according to a rate -- and it begins to press to coincidence -- having -- each coating component -- the mixing ratio -- by the constant-flow ratio according to a rate, it is fed by the reserve mixer, preliminary mixing is carried out, and each coating component is distributed by homogeneity by this.

[0013] Therefore, the coating mixed with the reserve mixer will be filled up into the cylinder for feeding with the condition of having made homogeneity distributing each coating component, and will be maintained always uniformly [the mixed ratio].

[0014] And since the coating which it did [coating] in this way and made homogeneity distribute a coating component is temporarily stored in the cylinder for feeding, using the time amount, molecular diffusion progresses and each coating components get used in the interface of each coating component.

[0015] However, at this time, even if the particle size of the drop of each coating component is still comparatively large even if it says that it is distributing to homogeneity, and it paints as it is, sufficient paint film engine performance is not obtained.

[0016] Then, if a coating is fed from the cylinder for feeding to a coater or a coating tank, since the coating will be jet-ized with an injection mold diffusive-mixing vessel and each coating components with a big particle size will be atomized and spread, hydrophilic base resin, a hydrophobic curing agent, etc. are mixed by homogeneity also of the coating component which cannot be mixed easily.

[0017] Thus, since each coating components are mixed and fed by homogeneity in two steps of preliminary mixing-injection diffusive mixing, also when feeding [not to mention] a coating into a coater directly when filling up a coating tank with a coating and painting succeeding a long time, it can feed mixing each coating component to homogeneity just before a coater, and it is not necessary to store what was beforehand mixed mechanically with the blender etc.

[0018] Invention of claim 2 possessed two or more barrels with which a measuring cylinder fills up said coating component according to the daily dose [every] individual according to the mixed ratio respectively, and it has accomplished them so that it may be started and

stopped synchronous, while each piston which begins to press the coating component with which each [these] barrel was filled up has the same stroke length.

[0019] Since a coating component begins to be pushed by the flow rate according to a mixed ratio from each barrel only by filling up daily dose [every] each barrel according to that mixed ratio with coating components, such as base resin and a curing agent, according to an individual, and starting and stopping each piston synchronous by the same stroke according to invention of this claim 2, troublesome control becomes entirely unnecessary.

[0020] Invention of claim 3 is synchronized with restoration of the coating to the cylinder for feeding, and feeding of the coating from the cylinder concerned, and the coating component from said each measuring cylinder begins to push it, and it is filled up with the coating component to the cylinder concerned by turns.

[0021] According to invention of this claim 3, while the coating is fed from the cylinder for feeding, each measuring cylinder is filled up with a coating component. Since a coating component begins to be pushed from each measuring cylinder and the cylinder for feeding is filled up with a coating while the cylinder for feeding becomes empty The cylinder for feeding can perform restoration and feeding of a coating by turns, without preparing an interval continuously, therefore there is no futility in a tact time..

[0022] Moreover, if each cylinder is arranged in one cylinder unit and a static mixer and an injection mold diffusive-mixing machine are carried in a cylinder unit like invention of claim 4, since these will be formed in the all-in-one prepared in one, miniaturization and lightweight-ization of the whole equipment are attained, and it becomes as a whole more compact.

[0023] Invention of claim 5 is equipped with the washing system which introduces a washing fluid into each divided passage according to an individual, and washes the inside of the passage while it is divided by plurality until a series of passage which consists of piping which connects the reserve mixer with which the coating which mixed each coating component flows, the cylinder for feeding, an injection mold diffusive-mixing machine, and these results [from the upstream] down-stream.

[0024] Before the 2 liquid hybrid model coating which remains in the passage from a static mixer to a coating tank hardens even when supplying the base resin and the curing agent of an aquosity 2 liquid hybrid model coating from a measuring cylinder since each divided passage can be washed to coincidence according to invention of this claim 5, washing removal of this can be carried out easily in a short time.

[0025]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is concretely explained based on a drawing. The explanatory view in which the fluid circuit diagram and drawing 2 which show an example of the coating feeding equipment which drawing 1 requires for this invention show the external view, and drawing 3 shows the

actuation, and drawing 4 are the explanatory views showing a washing system.

[0026] The coating feeding equipment 1 shown in drawing 1 · drawing 4 is the thing of the type with which the coating tank 2 of a cartridge-type with which mixes the aquosity 2 liquid hybrid model coating which uses base resin and a curing agent as a coating component by the predetermined ratio, and a coater is equipped free [desorption] is fed and filled up.

[0027] This coating feeding equipment 1 respectively the base resin and the curing agent which are fed into the cylinder unit 3 from the base resin source of supply S1 and the curing agent source of supply S2 according to the daily dose [every] individual according to that mixed ratio And the measuring cylinder 4 which it begins to press to coincidence, The static mixer 5 which carries out preliminary mixing by passing the base resin and the curing agent which began to be pushed from the measuring cylinder 4 concerned (duct stirring mold - reserve -mixer), The cylinder 6 for feeding which feeds into the coating tank 2 the coating which carried out preliminary mixing of base resin and the curing agent by the static mixer 5 concerned, The injection mold diffusive-mixing machine 7 called the jet dispersion which makes the coating concerned jet-ize by the hydrostatic pressure of the coating fed from the cylinder 6 concerned to the coating tank 2, and makes homogeneity diffuse each coating component is formed.

[0028] The cylinder unit 3 is formed in the shape of [of an abbreviation rectangular parallelepiped] a block, and it is mutually formed in parallel so that the barrel B1 and B·2 of the measuring cylinder 4 may be allotted to the both sides on both sides of the barrel B3 of the cylinder 6 for feeding. Moreover, each cylinders 4 and 6 are equipped with the pistons P1, P2, and P3 by which a hydraulic drive is carried out when beginning to press a coating component and a coating.

[0029] And as for the measuring cylinder 4, the hydraulic oil room 8 and bottom 3B side is formed in the coating component room 9 for the head 3H side of the cylinder unit 3 bordering on pistons P1 and P2. Moreover, as for the cylinder 6 for feeding, the coating room 10 and bottom 3B side is formed in the hydraulic oil room 11 for the head 3H side of the cylinder unit 3 bordering on the piston P3.

[0030] Each barrel B1 and B·2 of the measuring cylinder 4 were formed in the capacity which can be respectively filled up with base resin and a curing agent according to the daily dose [every] individual according to the mixed ratio, and they are accomplished so that it may be started and stopped synchronous, while each pistons P1 and P2 which begin to press the base resin and the curing agent with which each barrel B1 and B·2 were filled up have the same stroke length.

[0031] That is, each pulsion capacity to the stroke length of each pistons P1 and P2 is set up according to the mixed ratio, and since stroke length is the same, the flow rate of the base resin extruded from each barrel B1 and B·2 and a curing agent becomes equal to a mixed ratio.

[0032] Each [these] pistons P1 and P2 are attached in a beam 13 through a piston rod 12 at one, they synchronize mutually and a both-way drive is carried out by the same stroke by the supply pressure of the hydraulic oil supplied to a barrel B1 and the hydraulic oil room 8 of B-2, and the coating component supply pressure to the coating component room 9.

[0033] Moreover, inflow outlet 8a of hydraulic oil is formed in the hydraulic oil room 8, and 9 inches of input of a coating component and tap hole 9out are formed in the coating component room 9. 9 inches of input of each coating component room 9 And base resin (curing agent), washing air, It connects with the base resin source of supply S1 (curing agent source of supply S2) through the base resin bulb 14 (curing agent bulb 15) of the bulb equipment VA 1 (VA2) which supplies a penetrant remover alternatively. Tap hole 9out is connected to 5 inches of input formed in the cylinder bottom 3B side of a static mixer 5 through the base resin bulb 16 (curing agent bulb 17) of bulb equipment VA 3.

[0034] Bulb equipment VA 3 switches the passage which passes to a static mixer 5, and it can discharge to a drain the penetrant remover discharged from the measuring cylinder 4 while it supplies alternatively the base resin and the curing agent which began to be pushed from the measuring cylinder 4, washing air, and a penetrant remover in a static mixer 5. Moreover, tap hole 5out formed in the cylinder head 3H side of a static mixer 5 is connected to the cylinder 6 for feeding through the on-off bulb 18.

[0035] It comes to allot the element of a large number which a static mixer 5 repeats the flow in the passage where base resin and a curing agent join and flow, and divide, permute and carry out superposition ***** along a flow direction.

[0036] Each piston P3 which begins to press the coating with which a barrel B3 was filled up goes and comes back to it by the same stroke length as said each pistons P1 and P2 while the cylinder 6 for feeding is formed in a capacity equal to the aggregate supply of the base resin fed when said each pistons P1 and P2 stroke one time, and a curing agent. And the both-way drive of this piston P3 is carried out by the hydraulic oil supply pressure supplied to the coating supply pressure and the hydraulic oil room 11 which are supplied to the coating room 10 of a barrel B3.

[0037] In addition, the base-resin:curing agent which begins to be pushed when the mixing ratio of base resin and a curing agent is 5:2, and each pistons P1-P3 of each cylinders 4 and 6 are moved in unit length: Each barrels B1-B3 are designed so that the flow rate of a coating may be set to 5:2:7.

[0038] Moreover, by this example, although the capacity of a barrel B3 is arbitrary, when carrying out 3 ****s of pistons P3, it is formed in small [of the coating tank 2 / about about 1 / 3, and small] so that restoration of the mixed coating to the coating tank 2 may be completed.

[0039] 10 inches of coating input and tap hole 10out are formed in the coating room 10 of this cylinder 6 for feeding, and inflow outlet 11a of hydraulic oil is formed in the hydraulic oil

room 11. Tap hole 10out of the coating room 10 is connected to the injection mold diffusive-mixing machine 7 through the coating bulb 19 of bulb equipment VA 4.

[0040] This bulb equipment VA 4 supplies washing air and a penetrant remover to the injection mold diffusive-mixing machine 7 alternatively while making change-over connection of the tap hole 10out of the cylinder 6 for feeding at an injection mold diffusive-mixing machine 7 and drain side.

[0041] As for the injection mold diffusive-mixing machine 7, minor diameter orifice 7a is formed between 7 inches of input, and tap hole 7out. In this example, when the 2 liquid hybrid model coating which it comes to form opposed type minor diameter orifice 7a of the same axle formed in the diameter of about 0.2-0.5mm, and is supplied by 1·10MPa from the cylinder 6 for feeding passes orifice 7a, it is jet-ized.

[0042] Since the base resin and the curing agent which are contained in a coating will be in a atomization condition by this and it is spread, it is fed into the coating tank 2 by which the coating with which homogeneity will be mixed more with and the 2 liquid hybrid model coating was mixed more than enough in this way was connected to the coating regurgitation port 20.

[0043] Moreover, the hydraulic oil supply system D which collects the hydraulic oil discharged by said each cylinders 4 and 6 from each cylinders 4 and 6 while carrying out change-over supply of the hydraulic oil The hydraulic oil supply pipe 23 which supplies hydraulic oil by the supply pressure of 1·10MPa with a pump 22 from a hydraulic oil tank 21, It connects with the high-pressure piping 27 opened for free passage by the working-fluid room 11 of the low voltage piping 26 connected to each hydraulic oil room 8 of the measuring cylinder 4 through the change-over valve 25, respectively and the cylinder 6 for feeding of the drain 24 which returns hydraulic oil to a hydraulic oil tank 21 switchable.

[0044] In addition, the reducing valve 28 of 1 or less MPa of set pressures was infixed in the low voltage piping 26, and for it, it has accomplished so that the supply pressure of the base resin which begins to be pushed from the measuring cylinder 4, and a curing agent may be maintained to low voltage.

[0045] And restoration/pulsion of base resin and a curing agent, and restoration/pulsion of a coating are performed by performing closing motion control of each bulb equipments VA1-VA4 and the on-off bulb 18 at the same time the hydraulic oil supply system D performs supply/discharge of hydraulic oil to predetermined timing to each cylinders 4 and 6.

[0046] The above is an example of this invention and explains the operation with drawing 3 below. First, as shown in drawing 3 (a), the hydraulic oil room 8 of the measuring cylinder 4 is connected to a drain 24, the base resin bulb 14 and the curing agent bulb 15 of the bulb equipments VA1 and VA2 are opened, and each coating component room 9 is filled up with hydrophilic base resin and a hydrophobic curing agent (drawing 3 (b)).

[0047] And each bulb of the bulb equipments VA1 and VA2 is closed, the base resin bulb 16

and the curing agent bulb 17 of bulb equipment VA 3 which were formed in 5 inches of input of a static mixer 5 are opened, the change-over valve 25 of the hydraulic oil supply system D is operated, the hydraulic oil supply pipe 23 is connected to the low voltage piping 26, and the high-pressure piping 27 of the cylinder 6 for feeding is connected to a drain 24.

[0048] By this, hydraulic oil is supplied to the measuring cylinder 4 with the low voltage of 1 or less MPa, pistons P1 and P2 synchronize, and it slides on the cylinder bottom 3b side in one, and hydrophilic base resin and a hydrophobic curing agent push on a static mixer 5, are taken out, preliminary mixing is carried out, and it flows in the barrel B3 of the cylinder 6 for feeding (drawing 3 (c)).

[0049] Since pistons P1 and P2 synchronize at this time, even if an extrusion rate changes, the flow rate of the base resin supplied from the measuring cylinder 4 and a curing agent is always equal to a mixing ratio. And when base resin and a curing agent are fed into a static mixer 5 by the constant-flow ratio according to the mixed ratio, base resin and a curing agent will flow into the cylinder 6 for feeding, after homogeneity has distributed.

[0050] Therefore, in the cylinder 6 for feeding, after homogeneity has distributed, it fills up with the base resin and the curing agent which were maintained and mixed by the mixed ratio set up beforehand. And since base resin and a curing agent are supplied with low voltage, when base resin and a curing agent pass through the inside of a static mixer 5, or in case a mixed coating flows into the cylinder 6 for feeding, air bubbles do not arise.

[0051] And since the coating which it did [coating] in this way and made homogeneity distribute base resin and a curing agent is temporarily stored in the cylinder for feeding, using the time amount, molecular diffusion progresses and each coating components get [base resin and a curing agent] used in the interface of base resin and a curing agent.

[0052] However, only by carrying out call mixing by the static mixer 5, since base resin and a curing agent are a hydrophilic property and hydrophobicity, respectively, even if the diameter of each drop is large and paints as it is with a maximum of about 0.5mm, sufficient paint film engine performance is not obtained. then, the restoration to the cylinder 6 for feeding -- completing (drawing 3 (d)) -- while operating the change-over valve 25 of the hydraulic oil supply system D and connecting the hydraulic oil supply pipe 23 to the high-pressure piping 27, the hydraulic oil room 8 of each measuring cylinder 4 is connected to a drain 24.

[0053] The on-off bulb 18 is closed to coincidence, the back flow from the cylinder 6 for feeding is prevented, and the coating bulb 19 of the bulb equipment VA 4 opened for free passage by the injection mold diffusive-mixing machine 7 is opened. Furthermore, the base resin bulb 14 and the curing agent bulb 15 of the bulb equipments VA1 and VA2 which supply base resin and a curing agent to each measuring cylinder 4 are opened.

[0054] Thereby, first, hydraulic oil is supplied to the hydraulic oil room 9 of the cylinder 6 for feeding with the high pressure of 1·10MPa, and a 2 liquid hybrid model coating is sent out from the coating room 10 by the pressure equal to the supply pressure of hydraulic oil to the

injection mold diffusive-mixing machine 7 (drawing 3 (e)).

[0055] The 2 liquid hybrid model coating which flowed with the high pressure of 1·10MPa serves as high pressure from 7 inches of input of the injection mold diffusive-mixing machine 7 gradually toward opposed type minor diameter orifice 7a of the same axle formed in the diameter of about 0.2·0.5mm, and it is jetized in case minor diameter orifice 7a is passed. Since the base resin and the curing agent which are contained in a coating will be in a atomization condition by this and it is spread, diffusive mixing also of the hydrophilic base resin and the hydrophobic curing agent which cannot be mixed easily is carried out to homogeneity, and this is supplied to the coating tank 2 connected to the coating restoration port 20.

[0056] Thus, since each coating components are mixed and fed by homogeneity in two steps of preliminary mixing-injection diffusive mixing, also when feeding [not to mention] a coating into a coater directly when filling up the coating tank 2 with a coating and painting continuously for a long time, it can feed mixing each coating component to homogeneity just before a coater, and it is not necessary to store what was beforehand mixed mechanically with the blender etc.

[0057] In addition, while having beginning to push a 2 liquid hybrid model coating from the cylinder 6 for feeding and having filled up the coating tank 2, base resin and a curing agent are supplied to the measuring cylinder 4, and each coating component room 9 is filled up with base resin and a curing agent (drawing 3 (e)). Since each hydraulic oil is missed by the drain 24 even if the supply pressure of the base resin to each measuring cylinder 4 and a curing agent is low at this time, by the time the aggressiveness broth of the coating from the cylinder 6 for feeding is completed, it can be filled up in a short time.

[0058] Moreover, since the capacity of the cylinder 6 for feeding is the coating tanks 21/3, if the extrusion of the mixed coating in the cylinder 6 for feeding completes them If the loop of the procedure which is beginning to push base resin and a curing agent from each measuring cylinder 4, fills up the cylinder 6 for feeding with a mixed coating, is beginning to push this again immediately, and is supplied to the coating tank 2 is carried out 3 times and a total of 3 ****s of pistons P3 is carried out Restoration of the mixed coating to the coating tank 2 is completed (drawing 3 (b) - (e)).

[0059] Thus, while a mixed coating is beginning to be pushed from the cylinder 6 for feeding and the extrusion of the coating from the cylinder 6 for feeding is completed since each measuring cylinder 4 is filled up with base resin and a curing agent, restoration initiation of the coating can be carried out at the cylinder 6 for feeding.

[0060] Therefore, without preparing an interval between restoration of a coating, and feeding from the cylinder 6 for feeding, these can be performed by turns continuously, therefore there is no futility in a tact time. Moreover, since the cylinder for feeding can be filled up with a mixed coating, setting to the coating regurgitation port 20 the coating tank 2 of the empty

which is standing by next after restoration of a mixed coating is completed about the coating tank 2 of 1, a tact time until it exchanges the coating tank 2 and carries out restoration initiation can also be shortened.

[0061] Subsequently, by operating the bulb equipments VA1-VA4, when washing this coating feeding equipment 1, as shown in drawing 4, passage is divided from the upstream in four washing systems F1-F4 to the downstream. A penetrant remover and washing air are introduced into each washing systems F1-F4 from each bulb equipments VA1-VA4 arranged on each upstream, and by the washing systems F1-F3, the washing waste fluid is discharged from the bulb equipments VA3 and VA4 of the downstream to a drain, and is discharged outside by the washing system F4 from the restoration port 20 where the coating tank 2 is not connected.

[0062] The washing systems F1 and F2 specifically wash the passage reached [from the bulb equipments VA1 and VA2] to the drain of bulb equipment VA 3 through the inside of each measuring cylinder 4. The washing system F3 Washing the passage reached [from bulb equipment VA 3] to the drain of bulb equipment VA 4 through the inside of a static mixer 5 and the cylinder 6 for feeding, the washing system F4 washes the passage from bulb equipment VA 4 to the coating restoration port 6 through the inside of the injection mold diffusive-mixing machine 7.

[0063] Thus, since passage can be divided in two or more washing systems F1-F4 and each can be washed to coincidence The coating feeding equipment 1 whole by being able to wash quickly and certainly and washing to the timing of arbitration if needed A 2 liquid hybrid model coating can prevent beforehand remaining and hardening in piping which connects a static mixer 5, the cylinder 6 for feeding, the injection mold diffusive-mixing machine 7, and these etc.

[0064] In addition, the hydraulic oil supply system D may install the system which formed the pump which supplies hydraulic oil not only to when supplying hydraulic oil to each cylinders 4 and 6 with one pump 22, but the measuring cylinder 4 with low voltage, and the system which formed the pump which supplies high-pressure hydraulic oil to the cylinder 6 for feeding. Furthermore, the case where it supplies by the constant pressure of not only when beginning to push a coating component with low voltage from the measuring cylinder 4 and beginning to press a 2 liquid hybrid model coating with high pressure from the cylinder 6 for feeding, but 1MPa extent is sufficient.

[0065] Moreover, if the piston rod (not shown) of the cylinder 6 for feeding is attached in the beam 13 in one with the piston rods R1 and R2 of the measuring cylinder 4, all the pistons P1-P3 can be synchronized, and it can also be made to slide by the same stroke.

[0066] According to this, when each pistons P1-P3 synchronize and retreat, the cylinder 6 for feeding is filled up with a mixed coating at the coincidence to which base resin and a curing agent are sent out by the predetermined flow rate according to a mixing ratio from each

measuring cylinder 4. Moreover, base resin and a curing agent are fed by each measuring cylinder 4 at the same time a mixed coating begins to be pushed on the coating tank 2 from the cylinder 6 for feeding, when each pistons P1-P3 synchronize and move forward. Thus, only by synchronizing each pistons P1-P3, and making it move by the same stroke, since base resin and a curing agent are mixed with a predetermined mixing ratio, the control of flow and timing control become easier.

[0067] Furthermore, although above-mentioned explanation explained the 2 liquid hybrid model coating which consists of base resin and a curing agent, it can apply to the multicomponent hybrid model coating of the arbitration which mixes two or more sorts of coating components, such as two or more base resin, a curing agent and base resin, additives, etc.

[0068] The coating feeding equipment 1 of this invention can also be used further again as a coating feeder which supplies a direct coating to the coater which paints while receiving supply of not only when making the coating tank 2 with which the paint inside of a plane is equipped or equipped fill up with a coating, but a coating.

[0069]

[Effect of the Invention] according to [as stated above] this invention -- coating components, such as base resin and a curing agent, -- the mixing ratio from a measuring cylinder -- the daily dose [every] individual exception according to a rate -- and, since it begins to be pushed on coincidence If it feeds to a coater or a coating tank after being fed by the reserve mixer by the constant-flow ratio according to the mixed ratio, homogeneity's distributing and each coating component's filling up the cylinder for feeding with the coating The coating is jet-ized with an injection mold diffusive-mixing vessel, and since each coating components with a big particle size are atomized and spread, the effectiveness which was very excellent that a coating tank can be filled up with the condition of having mixed to homogeneity also of the coating component which cannot be mixed [curing agent / hydrophilic base resin, / hydrophobic] easily is done so.

[0070] Thus, since each coating components are mixed and fed by homogeneity in two steps of preliminary mixing-injection diffusive mixing Also when feeding [not to mention] a coating into a coater directly when filling up a coating tank with a coating, and painting succeeding long duration It is not necessary to store what was beforehand mixed mechanically with the blender etc., and is effective in the ability to feed, while mixing each coating component to homogeneity just before a coater or a coating tank.

[0071] Moreover, from a measuring cylinder, since it begins to be pushed a daily dose every, as for troublesome control of flow, coating components, such as base resin and a curing agent, have the effectiveness according to the mixed ratio of becoming needlessness entirely. While having the piston started and stopped synchronous by the same stroke as this time, for example, a measuring cylinder If the barrel of the volume which can be filled up with coating

components, such as base resin and a curing agent, according to the daily dose [every] individual according to the mixed ratio is used It can be begun by the flow rate according to the mixed ratio to press each coating component only by synchronizing a piston and moving, and is effective in drive control of a piston becoming very easy.

[0072] Furthermore, if it is made to synchronize with restoration of the coating to the cylinder for feeding, and feeding of the coating from the cylinder concerned, and the coating component from each measuring cylinder begins to push and it is filled up with the coating component to the cylinder concerned by turns Since a coating component begins to be pushed from each measuring cylinder and the cylinder for feeding is filled up with a coating while feeding the coating from the cylinder for feeding, and each measuring cylinder is filled up with a coating component and the cylinder for feeding becomes empty The cylinder for feeding is not preparing between restoration [of a coating], and feeding interval raw, either, and it can perform restoration and feeding by turns continuously, therefore there is no futility in a tact time, and it is excellent in working efficiency.

[0073] And if each cylinder is arranged in one cylinder unit and a reserve mixer and a diffusive-mixing machine are carried in a cylinder unit, since these will be formed in the all-in-one type arranged on one, miniaturization and lightweight-ization of the whole equipment are attained, and there is also an advantage that it can be made a compact more as a whole.

[0074] Moreover, if it divides to plurality and a washing fluid is introduced into each divided passage according to an individual until it results [from the upstream] down-stream a series of passage which consists of piping which connects a reserve mixer, the cylinder for feeding, an injection mold diffusive-mixing machine, and these Since each passage can be washed to coincidence, even when supplying the base resin and the curing agent of an aquosity 2 liquid hybrid model coating from a measuring cylinder Before the 2 liquid hybrid model coating which remains in the passage from a reserve mixer to a coating tank hardens, it is effective in the ability to carry out washing removal of this simply [in a short time] and certainly.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The fluid circuit diagram showing the coating feeding equipment concerning this invention.

[Drawing 2] The external view.

[Drawing 3] The explanatory view showing the actuation.

[Drawing 4] The explanatory view showing the washing system.

[Description of Notations]

1 Coating feeding equipment

- 2 Coating tank
- 3 Cylinder unit
- 4 Measuring cylinder
- 5 Duct stirring mold reserve mixer
- 6 Cylinder for feeding
- 7 Injection mold diffusive mixing machine
- B1-B3 Barrel
- P1-P3 Piston
- F1-F4 Washing system